

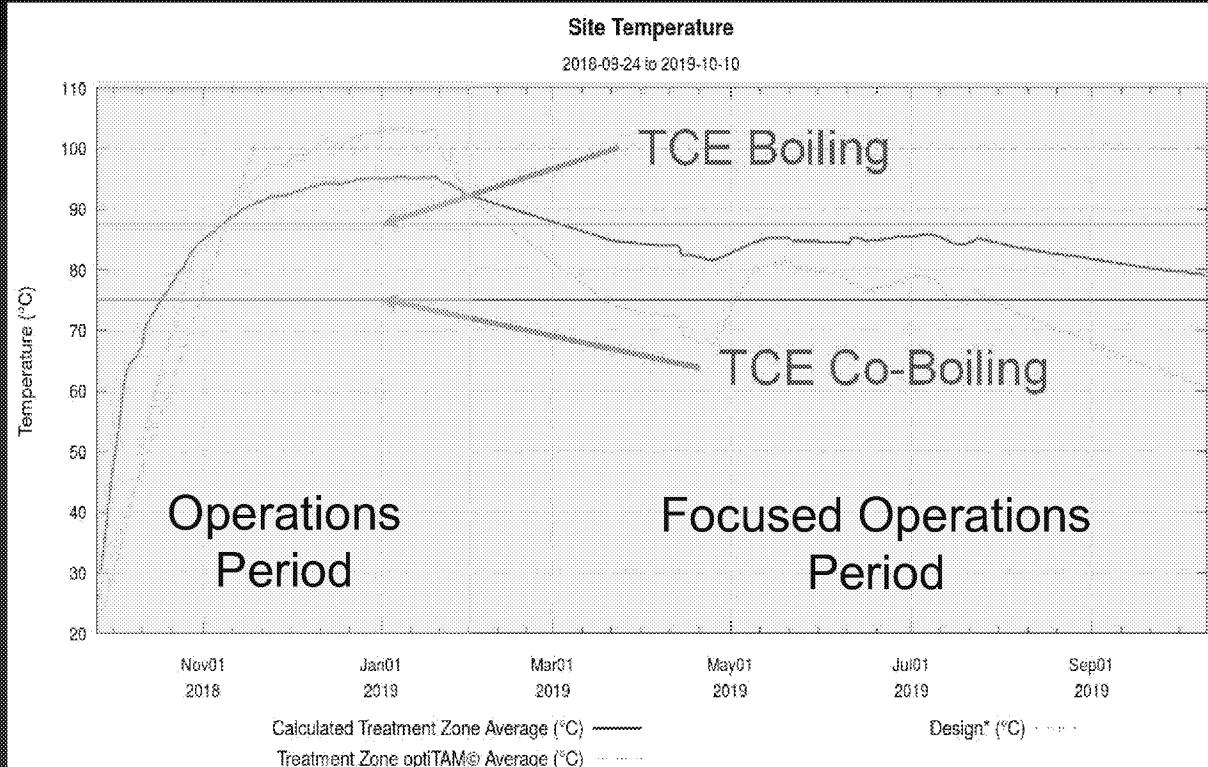
# Third Site ET-DSP™ - Zionsville, IN



October 15, 2019 Data Summary

# Timeline – Operations

- Began heating on Sep 24, 2018
- Temperatures > TCE co-boiling ( $73^{\circ}\text{C}$ ) and TCE boiling ( $87^{\circ}\text{C}$ ) below 5 feet BGS by Nov 2018



- Mass recovery flat by Feb 2019
- Extraction wells screened with PID throughout Jan 2019
- X-B2, X-D3, and X-A2 selected for screening sampling based on PID readings

# Timeline – Confirmation Sampling

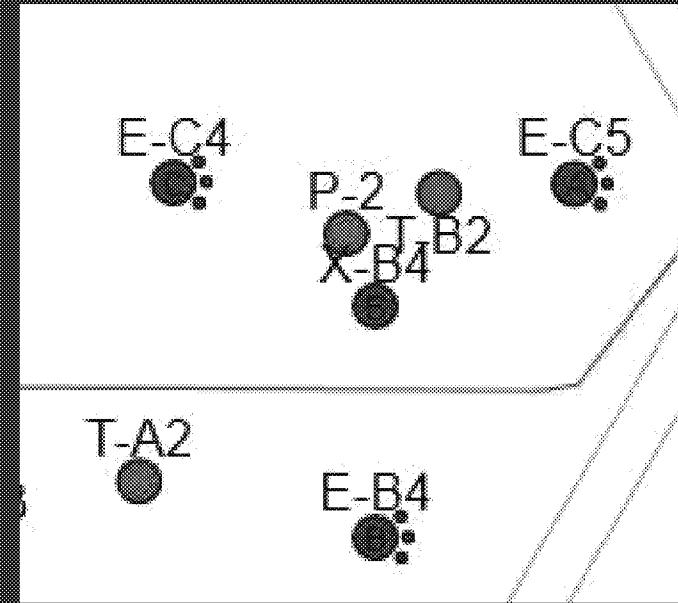
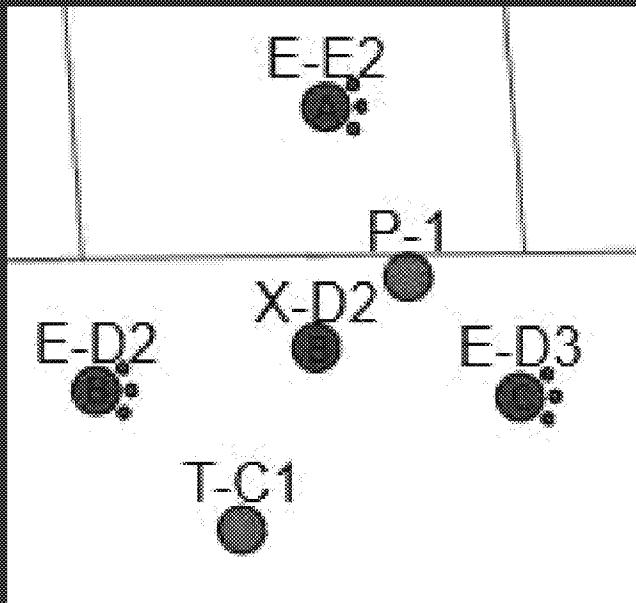
- Jan 30, 2019 screening results <210 ug/L TVOCs
- Confirmation sampling occurred on March 29, 2019 after a ~two-month delay
- Exceedances noted in P-1, P-2, and MW-27R
- MW-27R sample dominated by acetone, which is known to form at in-situ thermal sites
- P-1 sample dominated by 1,2-DCB and TCE
- P-2 sample dominated by 1,2-DCB and cis-1,2-DCE; met cleanup criteria based on original nine-contaminant COC list

# Timeline – Focused Operations

- MW-27R, P-1, and P-2 treatment began in Apr 2019
- Temperatures > TCE boiling achieved at P-1 and P-2
- Groundwater screening showed cleanup criteria met on August 2, 2019, using 72-contaminant COC list
- Confirmation sampling performed on September 5, 2019
- Exceedances noted in P-1 and P-2; MW-27R acetone remediated as expected
- P-1 sample dominated by TCE, 1,2-DCB, cis-1,2-DCE, xylene, and PCE
- P-2 sample dominated by 1,2-DCB; met cleanup criteria based on original nine-contaminant COC list

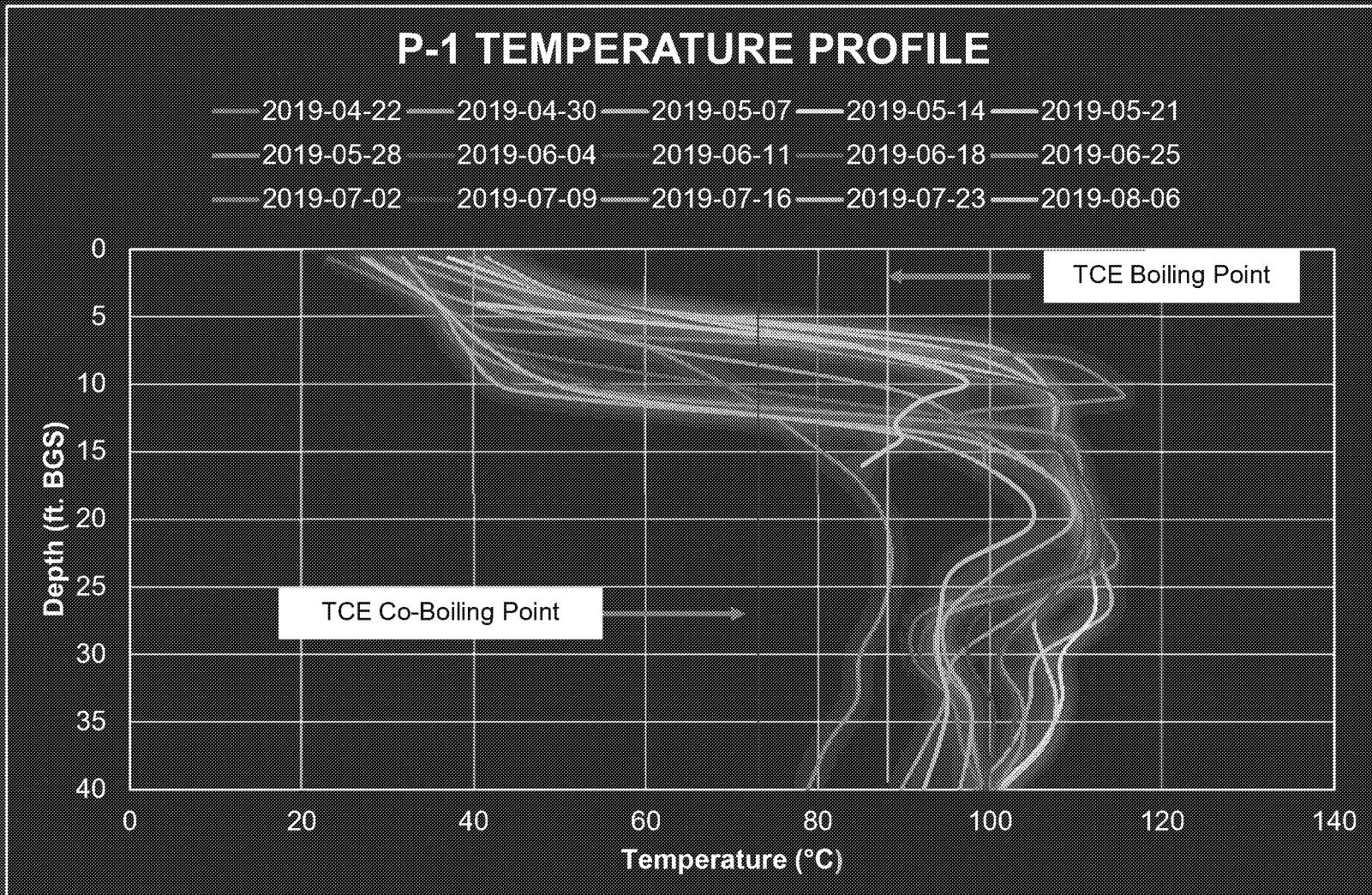
# Lines of Evidence - Extraction

- X-D2 within ~8 feet of P-1; X-B4 within ~6 feet of P-2
- Extraction not an issue



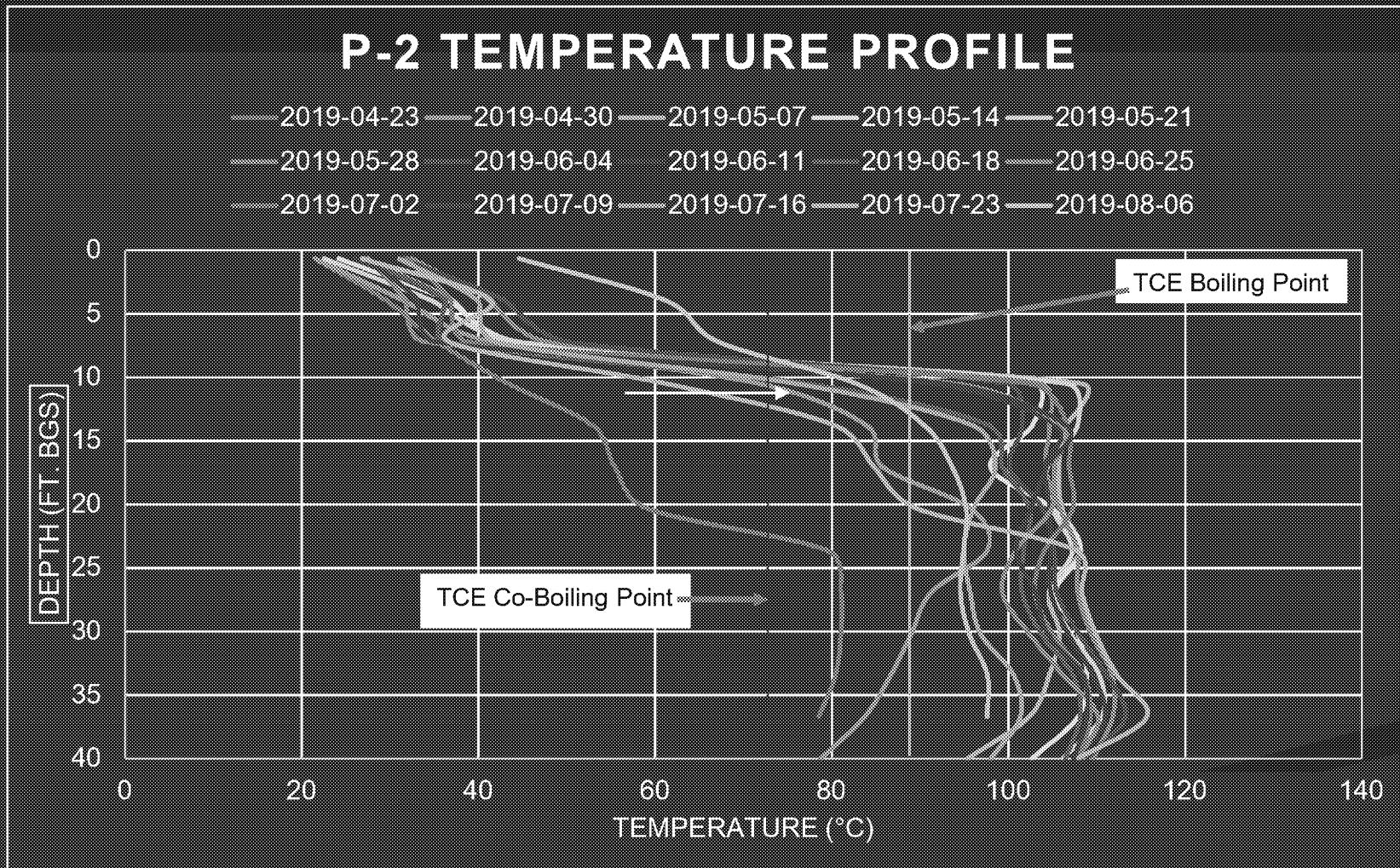
# Lines of Evidence – Temperature

- P-1 temperatures more than adequate



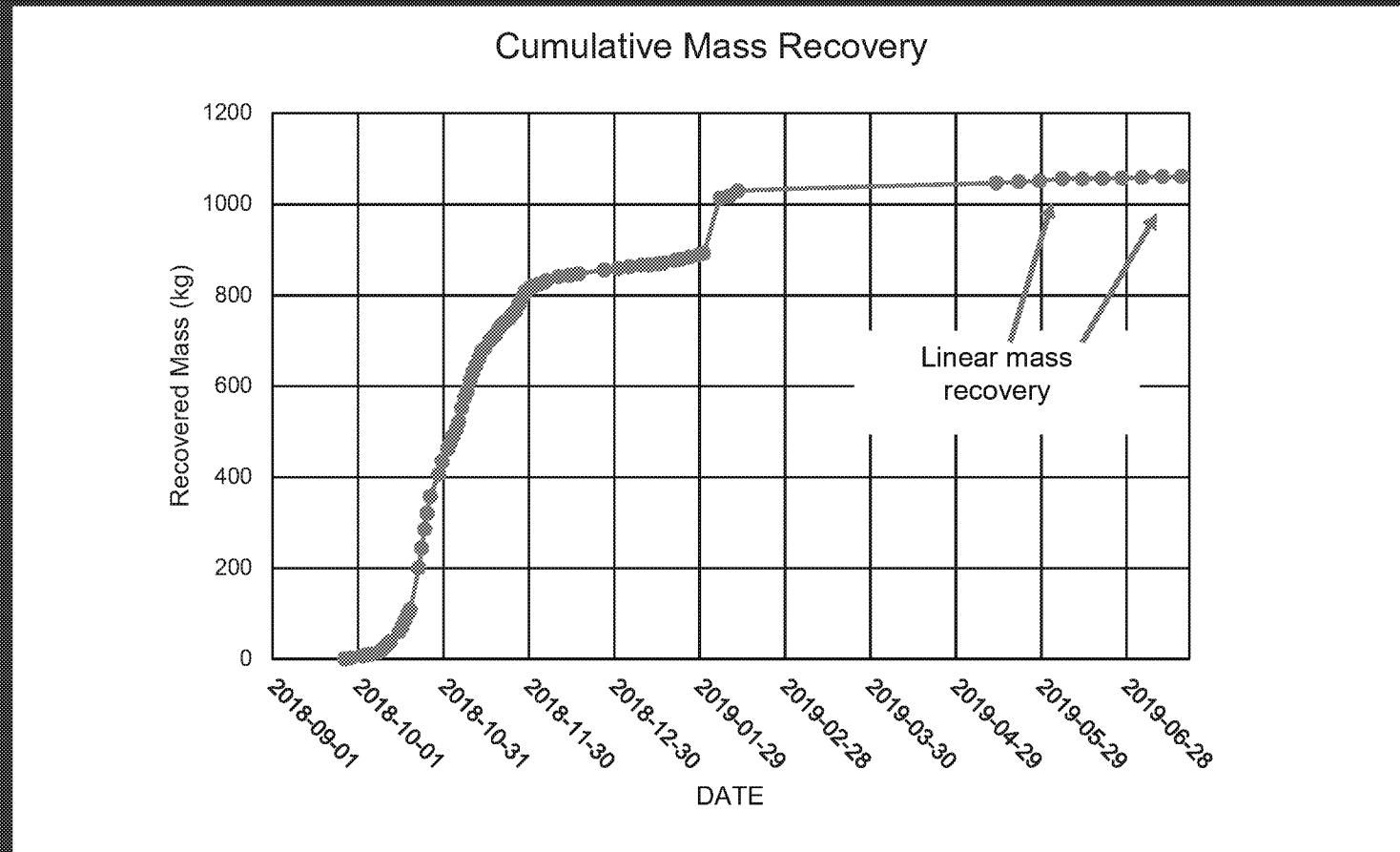
## Lines of Evidence – Temperature

- P-2 temperatures more than adequate



# Lines of Evidence – Recovery

- Mass recovery slightly linear upward during focused operations, indicating source outside heated volume<sup>1</sup>



<sup>1</sup>See, for example, POSTER PRESENTATION, REMTEC 2019

"Assessing Performance and Making ISTR More Sustainable: A Multiple Lines of Evidence Approach For Determining When to Shut Down an In Situ Thermal Remediation System"

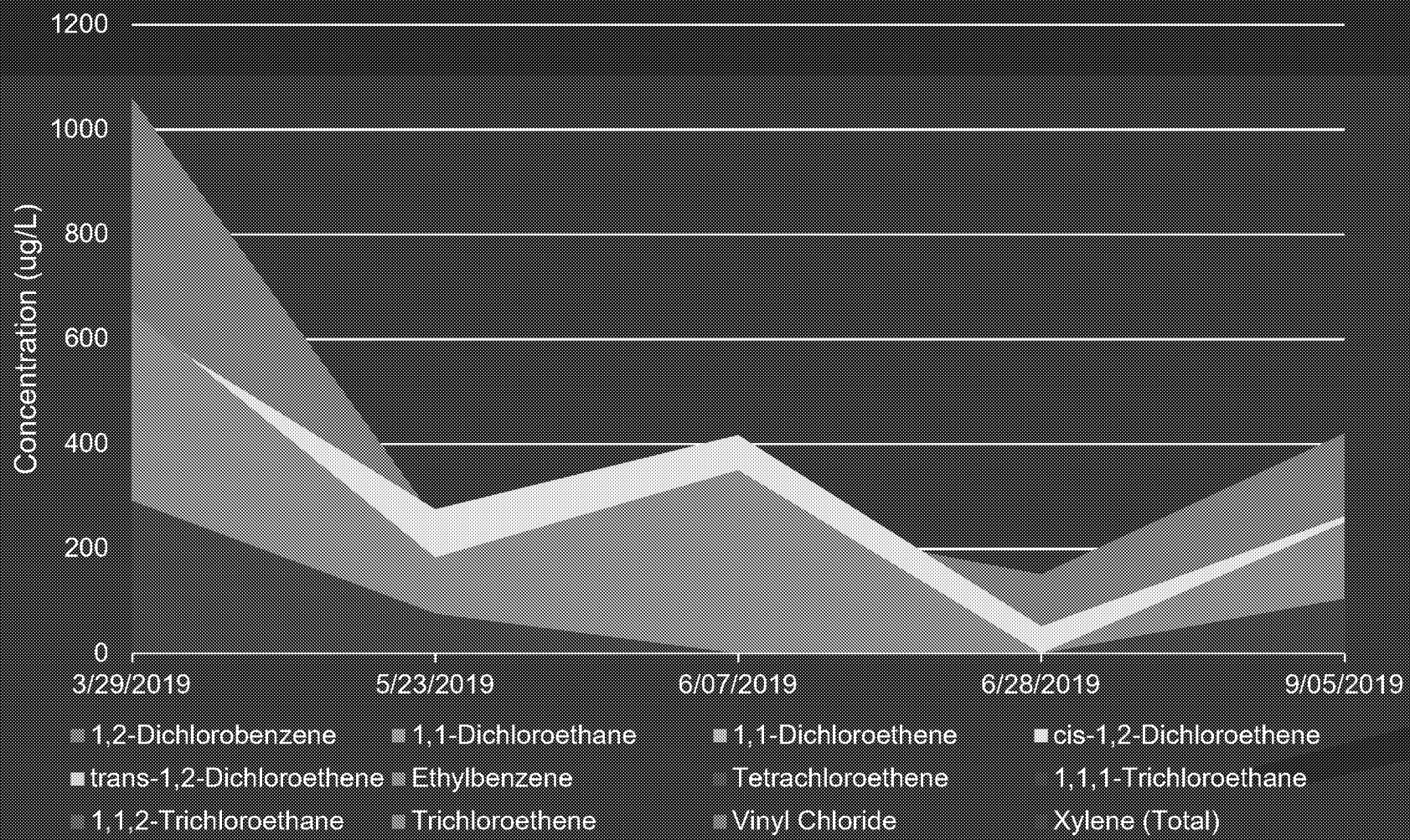
<https://www.remtecsummit.com/john-lachance>

# Lines of Evidence

- Concentration Increases
  - P-1: 43x increase in TCE from 356 ug/L on Jun 28, 2019 to 15,200 ug/L on Sep 5, 2019
  - P-1: Cis-1,2-DCE from non-detect to 2,630 ug/L from Mar 29, 2019 to Sep 5, 2019
  - P-2: From non-detect for nine original COCs on Aug 6, 2019 to 1,637 ug/L on Sep 5, 2019
- High concentrations indicate continuing source material
- Temperature, extraction, and mass recovery data indicate source external to heated volume

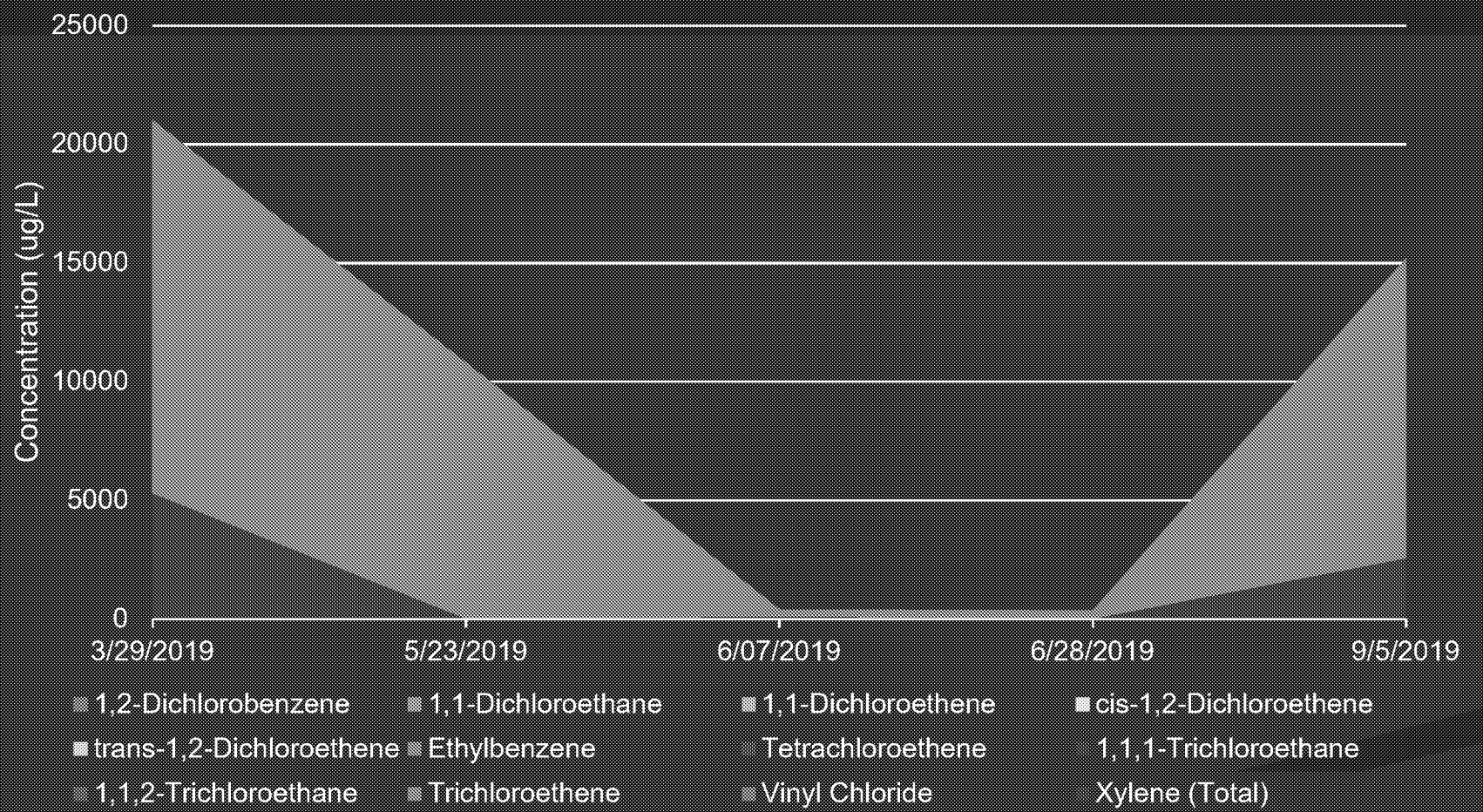
# Concentration Trends – Sump

- Meets all criteria



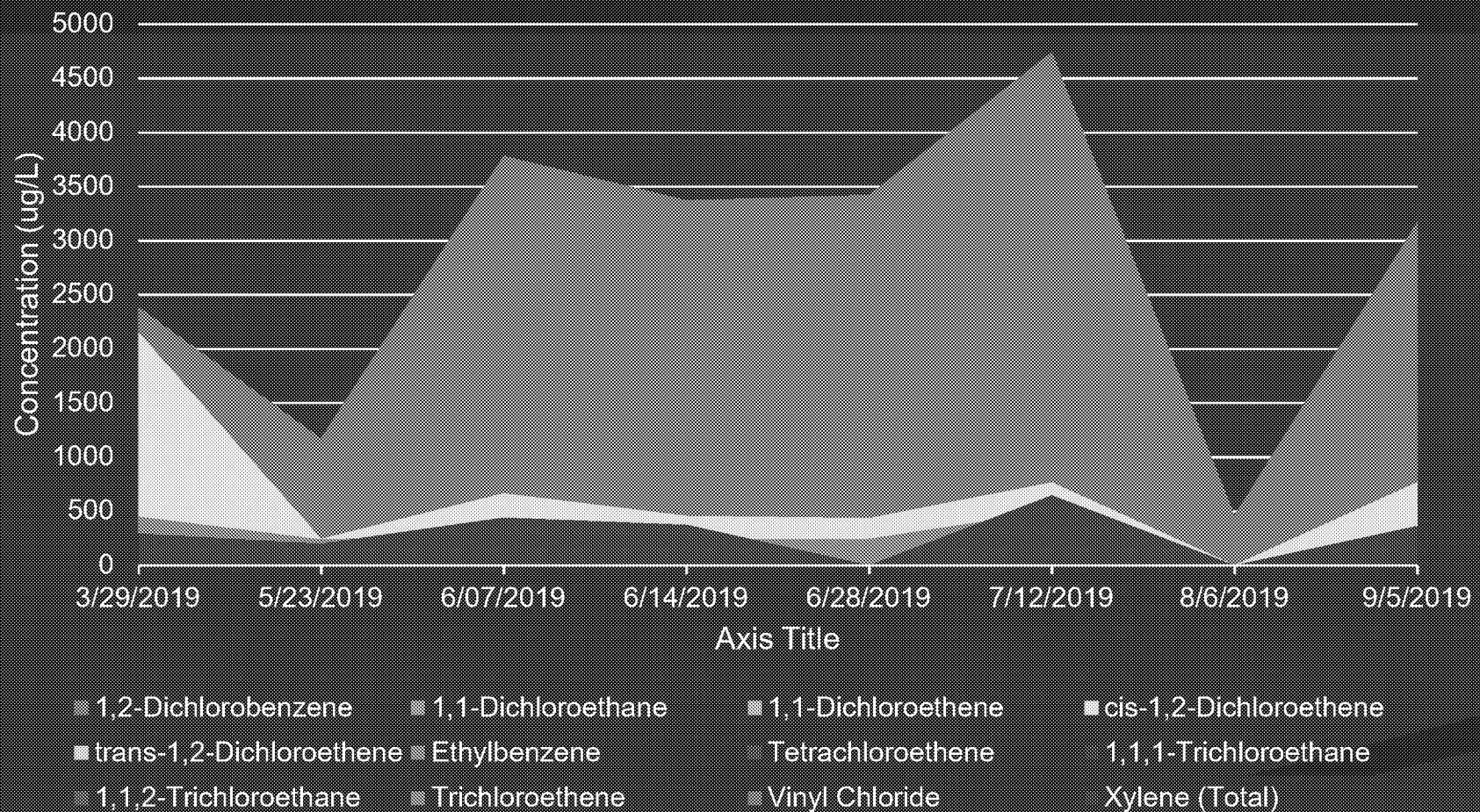
# Concentration Trends – P-1

## - Governed by Trichloroethene



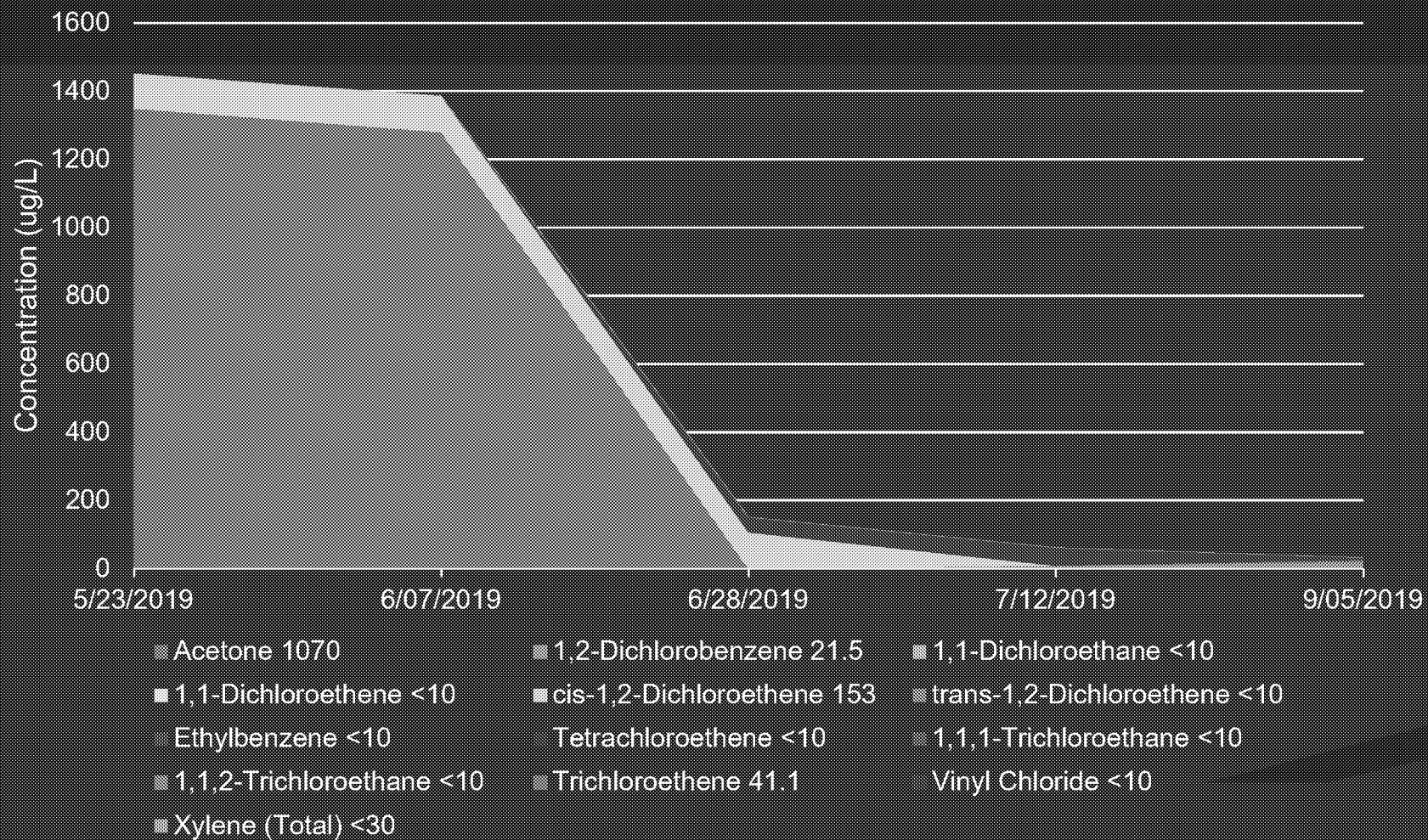
# Concentration Trends – P-2

## - Governed by 1,2-Dichlorobenzene

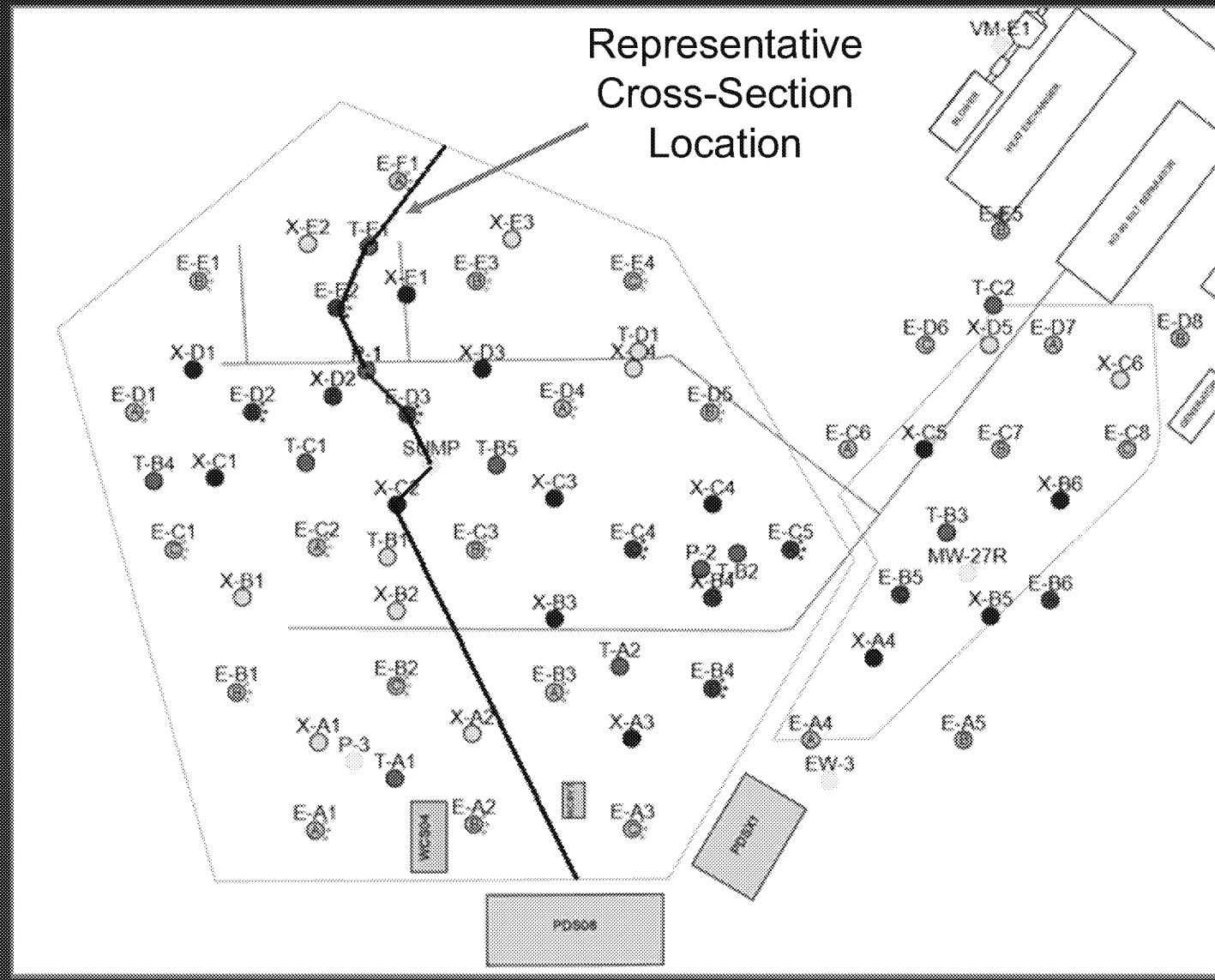


# Concentration Trends – MW-27R

- Governed by Acetone concentration
- Meets all criteria

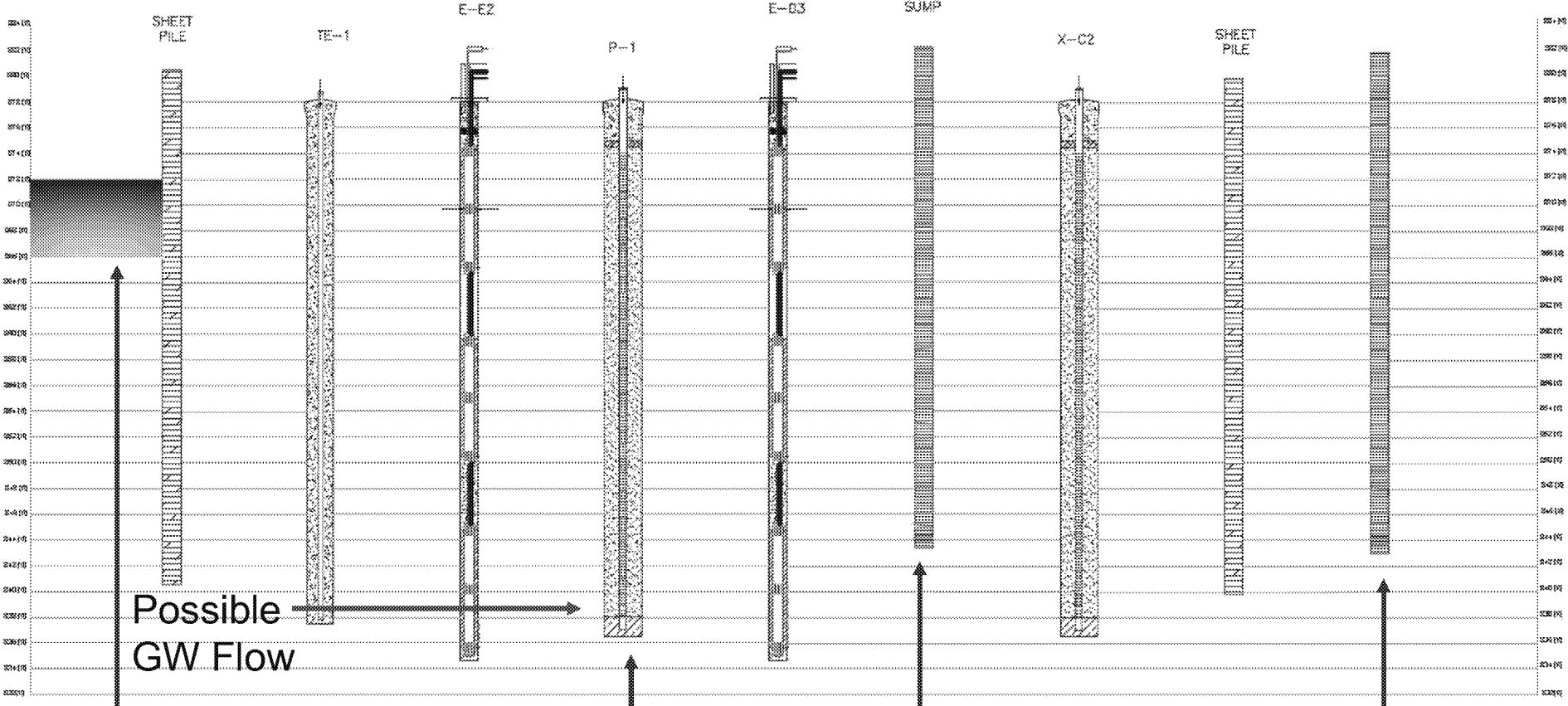


# Third Site Wellfield



# Third Site Wellfield Cross-Section

Horizontal axis is not to scale



Pond

Third Site ET-DSP™ - Zionsville, IN

P-1 and P-2 extend  
below sheet pile  
*Concentrations  
Rebound*

Sump within  
sheet pile  
*No Rebound*

Extraction wells  
south of sheet pile  
*Induced GW Flow*

# Going Forward

*Definition of insanity: Doing the same thing over and over again and expecting different results*

- Temperature and extraction data indicate that the treatment volume has been fully treated
- Temperature and extraction data indicate that P-1 and P-2 areas have been thoroughly treated again during focused operations
- Concentration data show remediation followed by recontamination at P-1 and P-2
- The site must be investigated for continuing sources outside of the heated volume